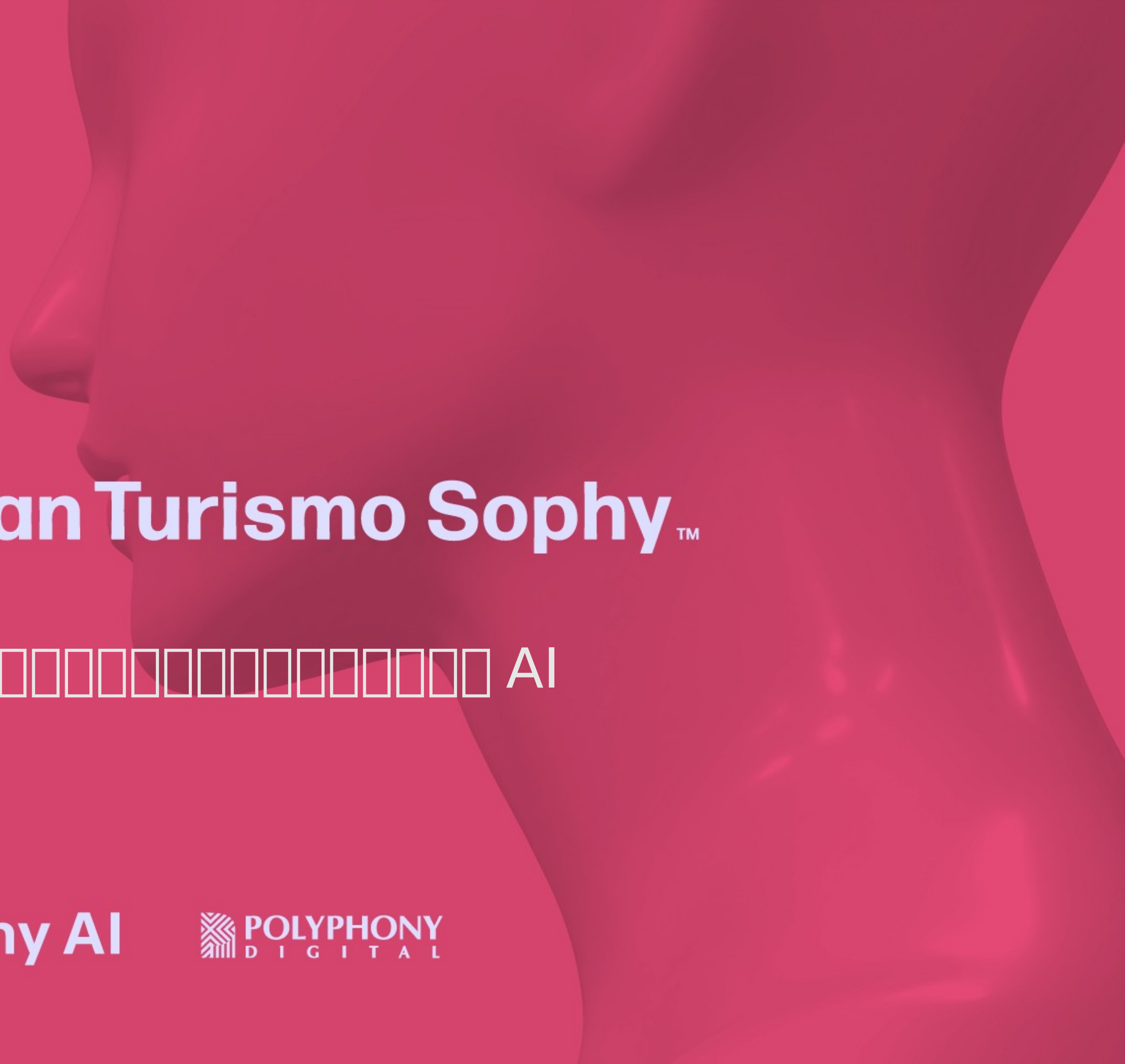


Gran Turismo Sophy™

AI

Sony AI

POLYPHONY DIGITAL

[illegible]

Polyphony Digital [illegible]

- Gran Turismo Sophy (GT Sophy) [illegible]
  - [illegible] AI [illegible]
  - [illegible] AI
  - [illegible] AI [illegible]

Sony AI [illegible]

- GT Sophy [illegible]
  - [illegible]
  - [illegible]
  - [illegible]

Gran Turismo Sophy

- [illegible] AI [illegible]
- [illegible]

Sony AI

POLYPHONY DIGITAL

Sony Interactive Entertainment

[illegible]

[illegible] API [illegible] GT [illegible]

[illegible] PlayStation Now [illegible] GT Sophy [illegible]

□□□□□□□ AI?

Race Together 2021

- GT [illegible] GT Sophy [illegible]
- [illegible]
- 2021/7 [illegible] 2021/10 [illegible]

- [illegible] AI [illegible]
- 3 [illegible]

- https://www.gran-turismo.com/jp/gran-turismo-sophy/

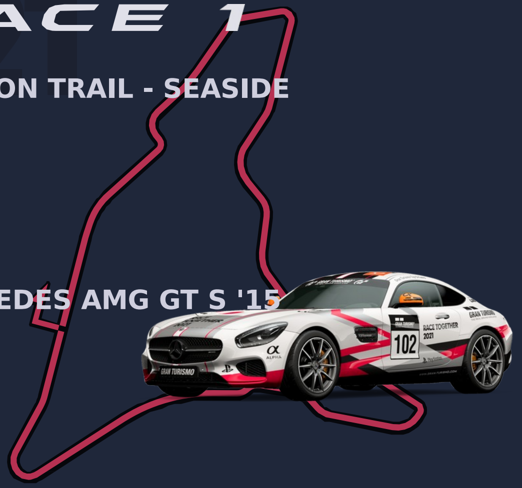
RACE TOGETHER 2021

Race Together **Overview**

July & Oct

RACE 1

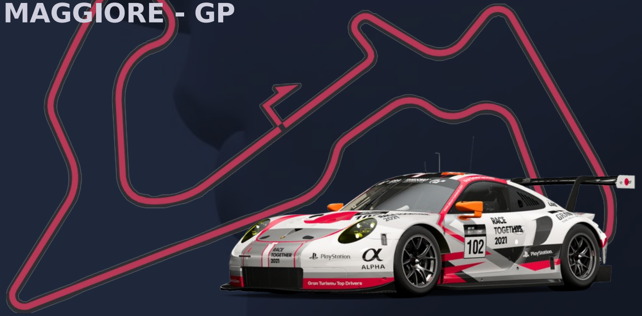
DRAGON TRAIL - SEASIDE



MERCEDES AMG GT S '15

RACE 2

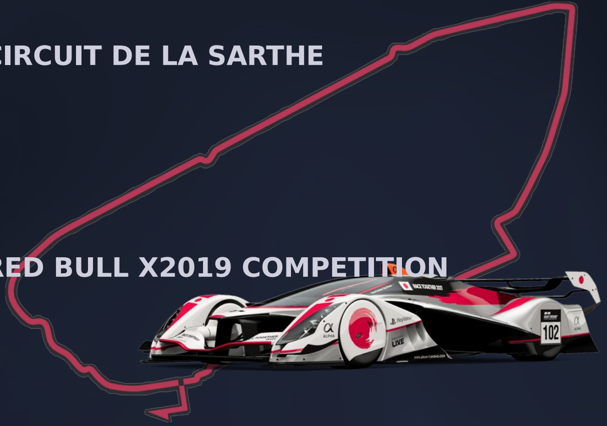
AUTODROME LAGO MAGGIORE - GP



PORSCHE 911 RSR (991) '17

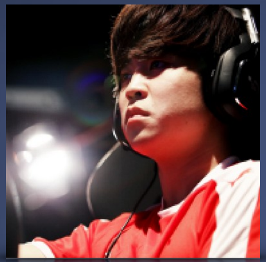
GRAND FINAL

CIRCUIT DE LA SARTHE



RED BULL X2019 COMPETITION

Team Gran Turismo **Top Drivers**



RACE TOGETHER 2021

Race Together
Results
July & Oct

	Team Gran Turismo **Top Drivers**		Team **Gran Turismo Sophy**
Race Day 1 JULY	8 POINT	:	7 POINT
Race Day 2 OCTOBER	52 POINT	:	104 POINT

RACE
TOGETHER
2021

Driver **Testimonials**

GT DRIVER

Takuma Miyazono

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> “AI □□□□□□□”□□□□□□□□□□□□□□
> □□□□□□□□□□□□□□□□□□□ GT
> Sophy □□□□□□□□□□□□□□□□

GT DRIVER

Emily Jones

> GT Sophy □□□□□□□□□□□□□□□□
> □□□□□□□□□□□□□□□□□□□□□□□□□
> □□□□□

Race Together 2021

- Superhuman □□□
- □□□□□□□□□□□□□□□□

- Nature □□□□□□□□
    - Outracing champion Gran Turismo drivers with deep reinforcement learning

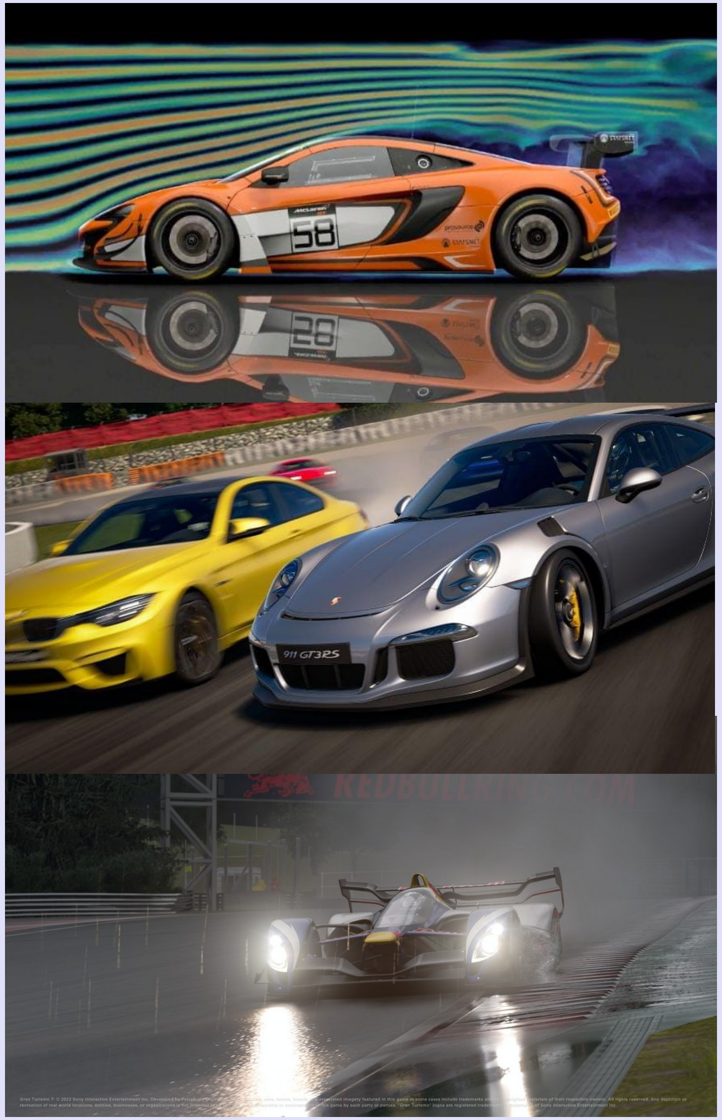
- https://www.natureasia.com/ja-jp/nature/602/7896

□□□□□□□□ (GT)

PS5
GRAN TURISMO® 7
THE REAL DRIVING SIMULATOR
CERO
審査予定
レーティング
アートワークは最終ではありません
大部分の機能はインターネットへの接続が必要です
STUDIOS
POLYPHONY DIGITAL

GT [illegible]

- [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - …
- GT7
  - [illegible]
  - [illegible]



GT□eSports

- e-MortorSports □□□□□□□□
  - Gran Turismo World Series
  - □□
  - Olympic Virtual Series
  - Red Bull 5G
  - …

- □□□□□□□□eSports□□□□□□

Gran Turismo World Series 2022

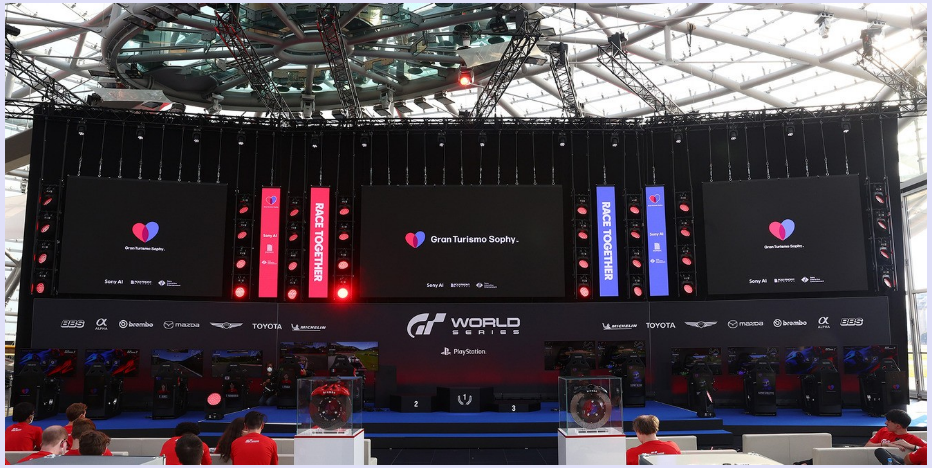
- GT [illegible]
- [illegible]

- [illegible]
- [illegible]

[illegible] Showdown

- [illegible]
- [illegible] 7 [illegible]
- [illegible]
- https://www.gran-turismo.com/jp/live/

- GT Sophy [illegible]



A SUPERHUMAN
RACING AI AGENT
Gran Turismo Sophy™
RACE TOGETHER 2021
Sony AI

[illegible]AI[illegible]

- [illegible]AI
  - [illegible]
  - [illegible]
    - [illegible]
    - [illegible]
- GT Sophy
  - [illegible]
  - [illegible]

GT[illegible]AI[illegible]

- [illegible]AI[illegible]
- [illegible]
  - [illegible]
  - [illegible]
- [illegible]
- [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
- Race Together
  - AI[illegible]

GT Sophy [illegible]

- GT Sophy [illegible]
  - [illegible]
  - [illegible]
- GT [illegible] PlayStation® [illegible]

- REST API
  - GT [illegible]
  - [illegible]
  - [illegible]
  - [illegible]

[illegible]

GT Sport/GT7
AI [illegible]
HDMI/59.94Hz
Linux PC
REST API
Ethernet/10-60Hz
PlayStation®4/5
USB
[illegible]

PlayStation® [illegible] GT Sophy [illegible]

- [illegible] Neural Network Libraries (NNabla) [illegible] PlayStation® [illegible]
- [illegible]
  - GT Sophy [illegible]
  - [illegible] 10MB [illegible]
- [illegible]
  - PS5 [illegible]
- [illegible]

GT7 [illegible]

- [illegible] GT Sophy [illegible]
- GT Sophy [illegible]

- [illegible] GT Sophy [illegible]

[illegible]

- GT Sophy [illegible]
  - [illegible]
- [illegible]
  - [illegible] eSports [illegible]
- [illegible] AI [illegible]

PDI

- Gran Turismo Sophy (GT Sophy)
  - AI
  - Gran Turismo AI
  - Gran Turismo AI

Sony AI

- GT Sophy

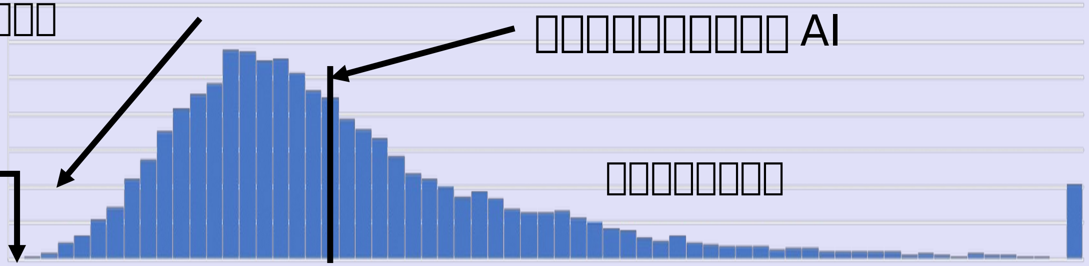
Gran Turismo [illegible]

- [illegible]
  - [illegible] ...
    [illegible]
  - [illegible]
- [illegible]
  - [illegible]
  - [illegible]
- [illegible]

[illegible]

[illegible]

[illegible] 2-3 [illegible]

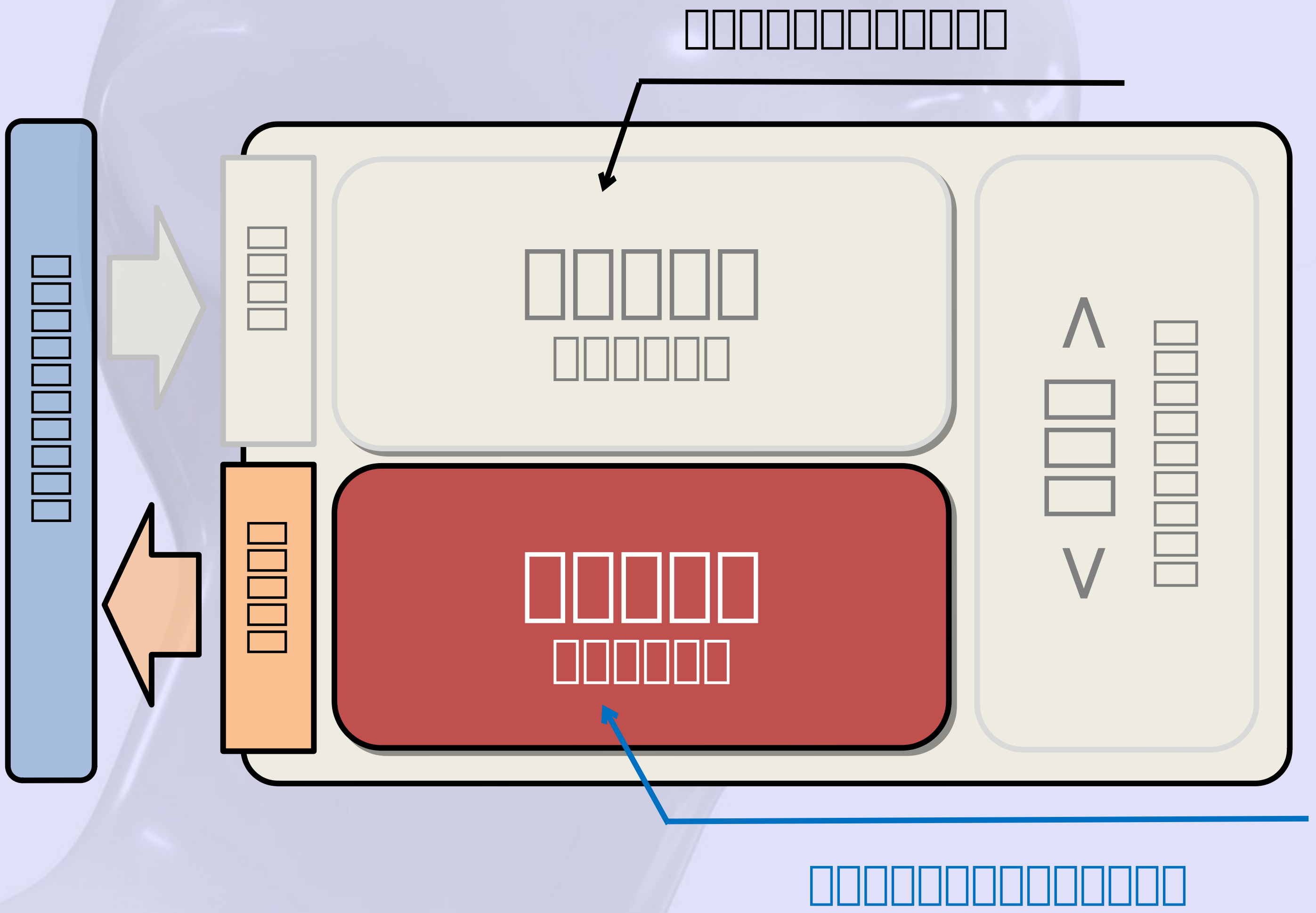


Gran Turismo [illegible]

- [illegible]
  - [illegible]
    [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
- [illegible]
  - [illegible]
  - [illegible]
    [illegible]

Gran Turismo Sport: TM & © 2021 Sony Interactive Entertainment Inc. Developed by Polyphony Digital Inc.

GT Sophy :



- /
  /

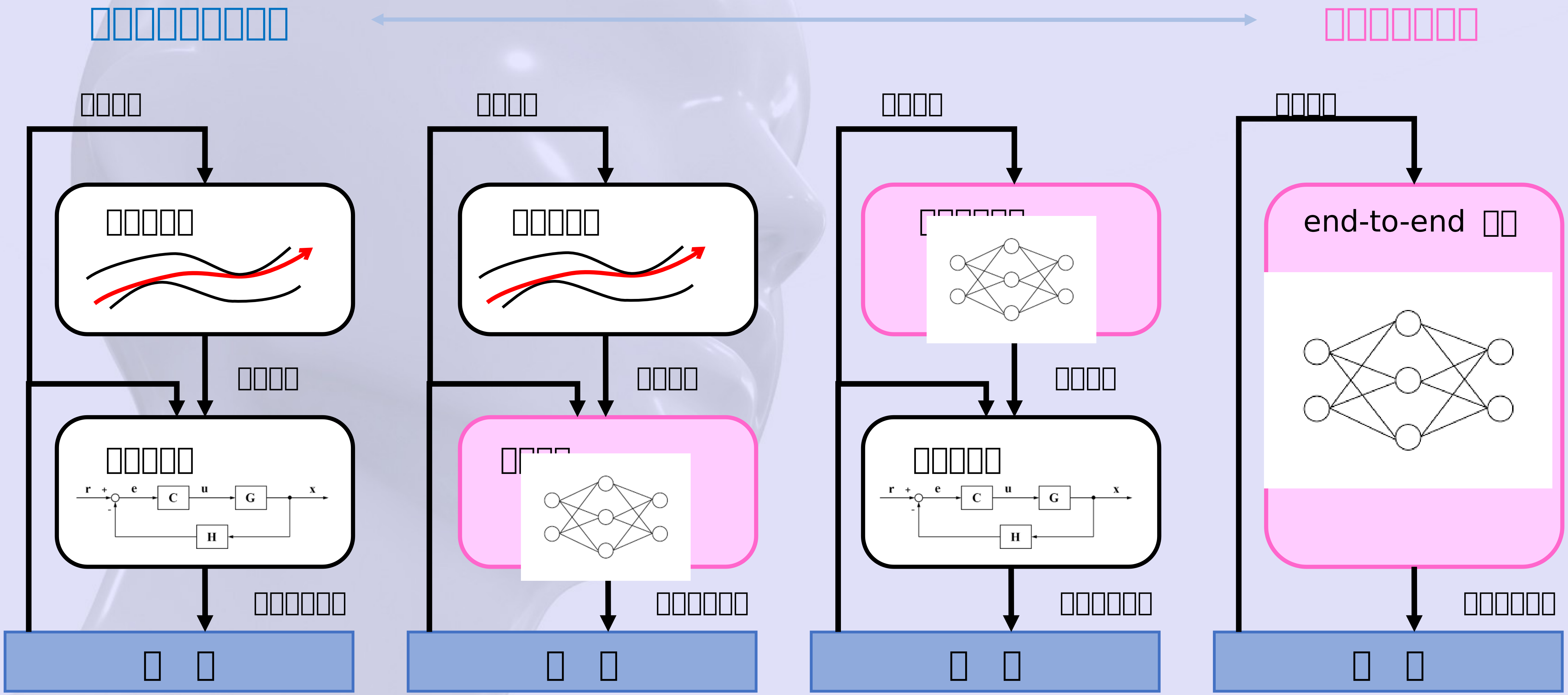
- if-then

Race Car Control

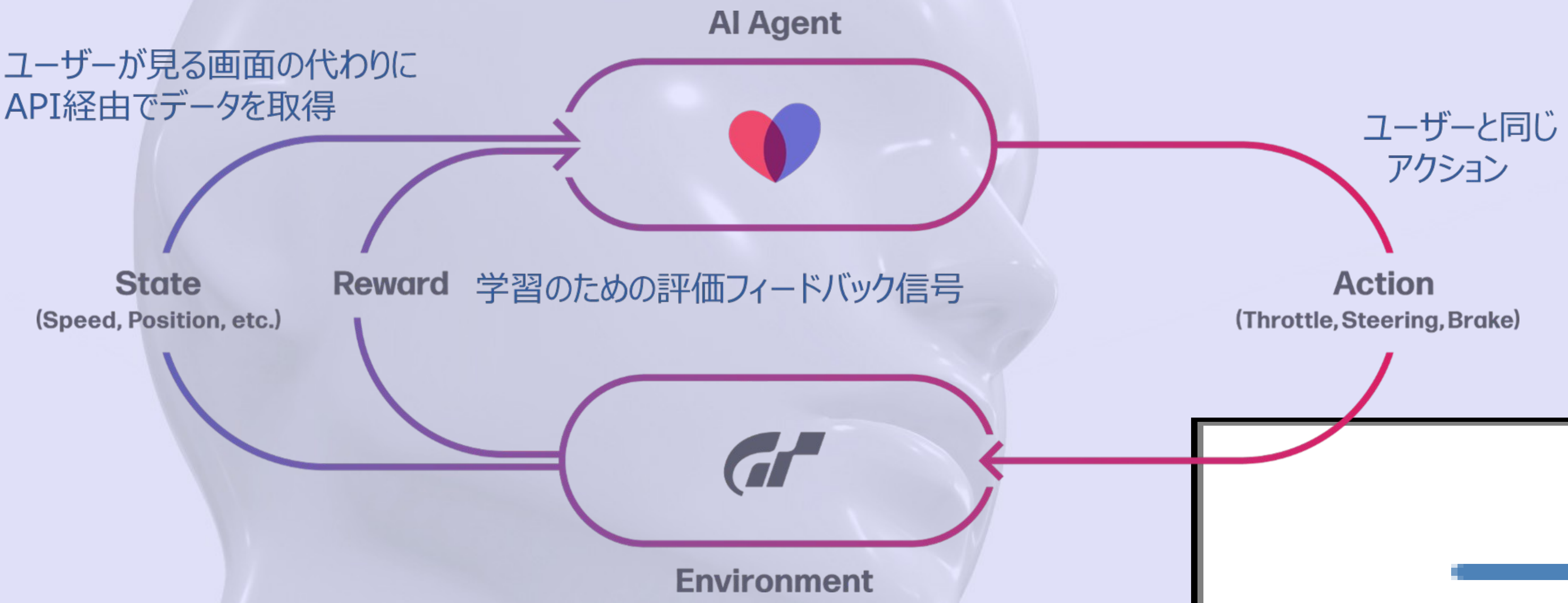
Racing Tactics

Racing Etiquette

: end-to-end learning

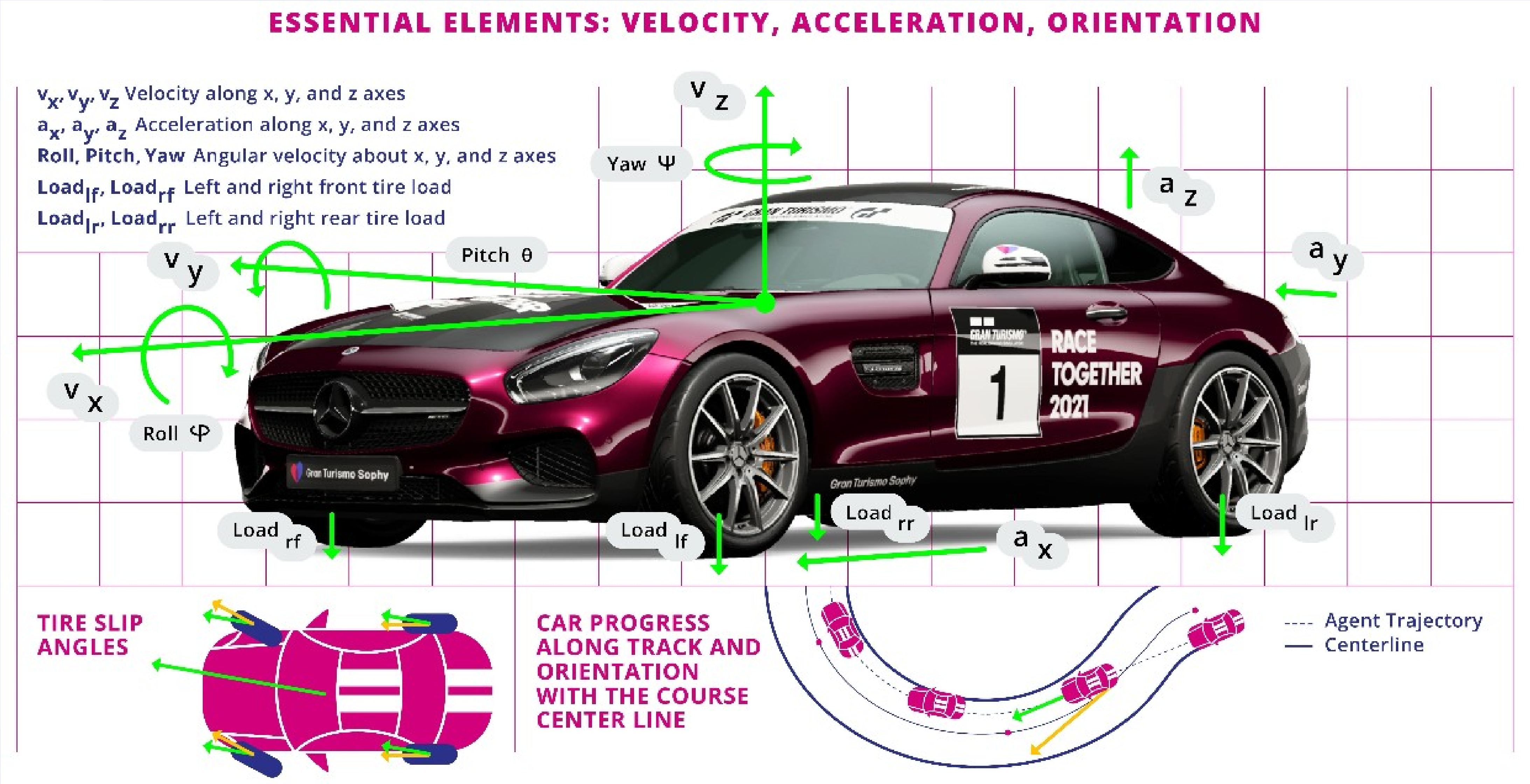


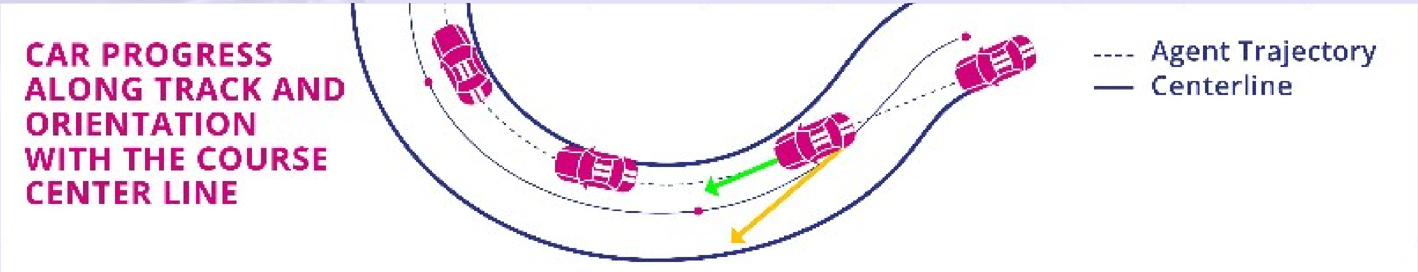
End-to-end, □□□□□□□□□



□□□□□□□
□ QR-SAC, Mixed scenario training
□□□□□□□□□
□ DART

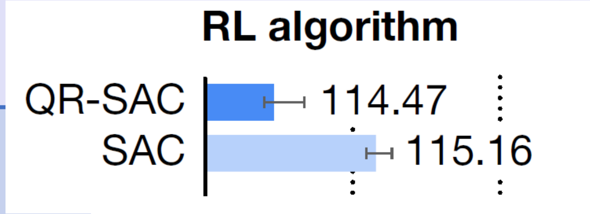
Gran Turismo Sport: TM & © 2021 Sony Interactive Entertainment Inc. Developed by Polyphony Digital Inc.


ESSENTIAL ELEMENTS: VELOCITY, ACCELERATION, ORIENTATION
vx, vy, vz Velocity along x, y, and z axes
ax, ay, az Acceleration along x, y, and z axes
Roll, Pitch, Yaw Angular velocity about x, y, and z axes
Loadlf, Loadrf Left and right front tire load
Loadlr, Loadrr Left and right rear tire load
vz
Yaw Ψ
az
ay
Pitch θ
vy
vx
Roll φ
Load rf
Load lf
Load rr
Load lr
ax
TIRE SLIP ANGLES
CAR PROGRESS ALONG TRACK AND ORIENTATION WITH THE COURSE CENTER LINE
---- Agent Trajectory
— Centerline


CAR PROGRESS
ALONG TRACK AND
ORIENTATION
WITH THE COURSE
CENTER LINE
Agent Trajectory
Centerline

QR-SAC:

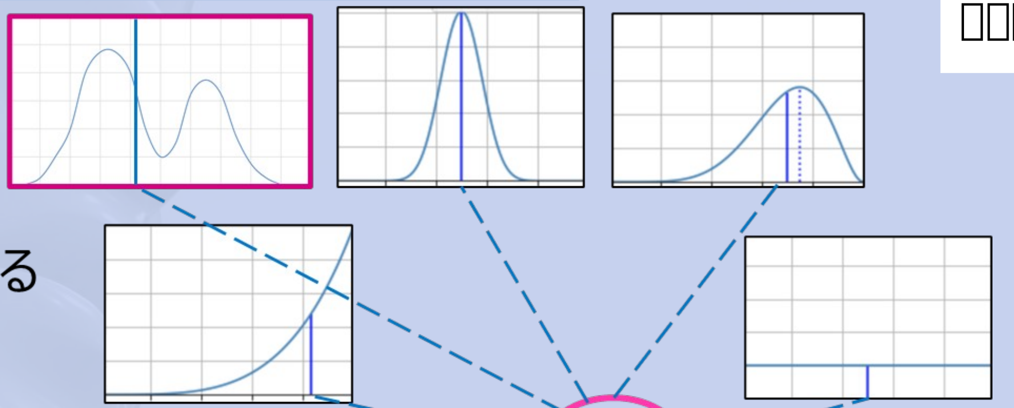
※ Quantile Regression Soft Actor Critic
Distributional RL



0.5

252

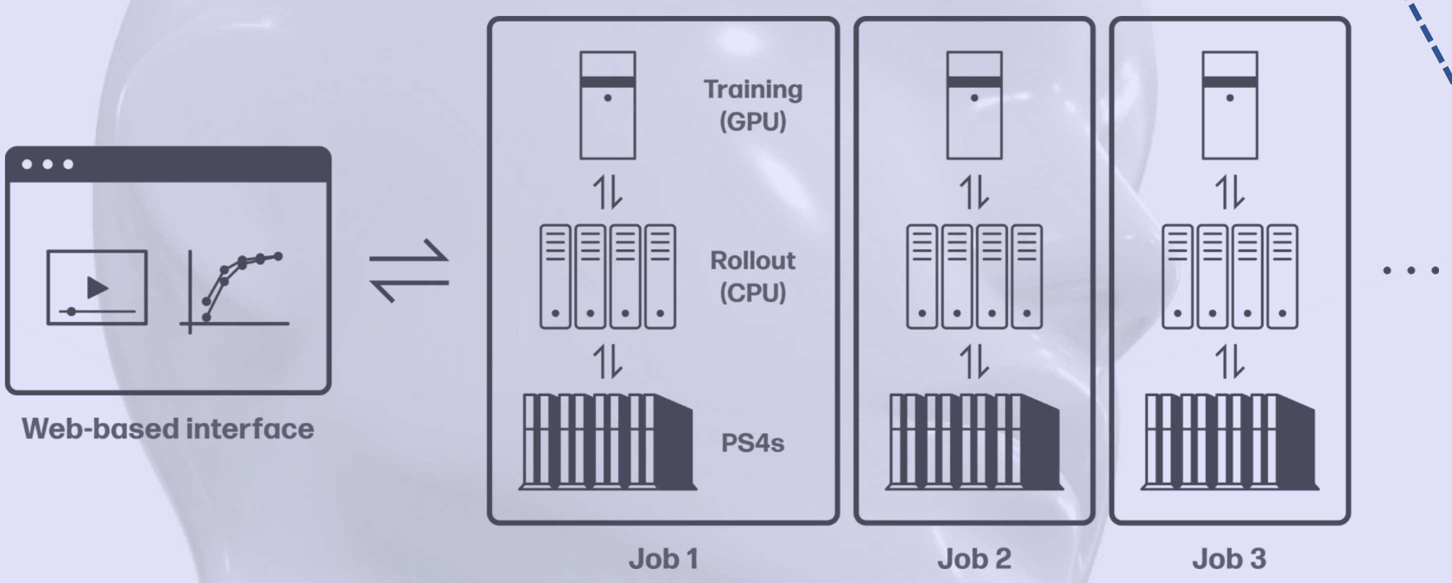
将棋を例にしたイメージ図



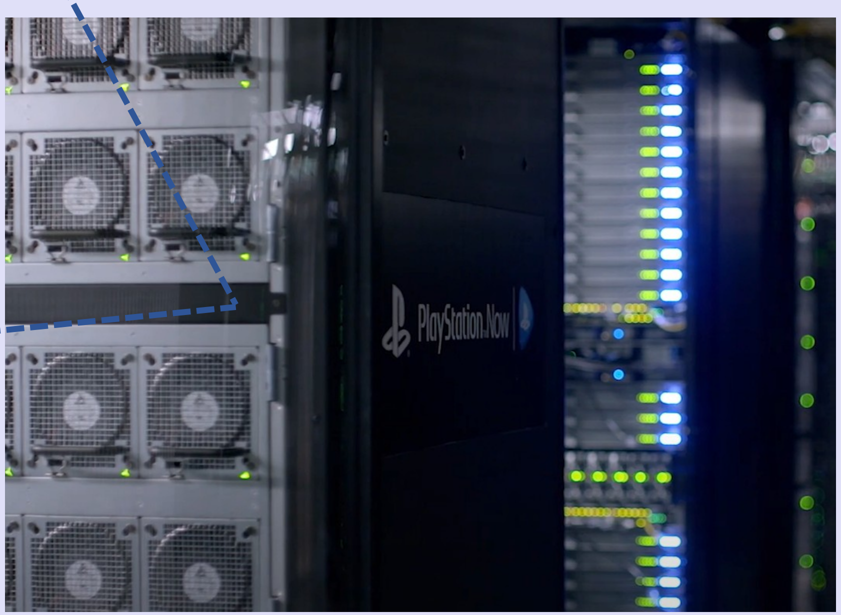
通常、盤面の評価はある１つの数字で表現される

252

DART: [illegible]



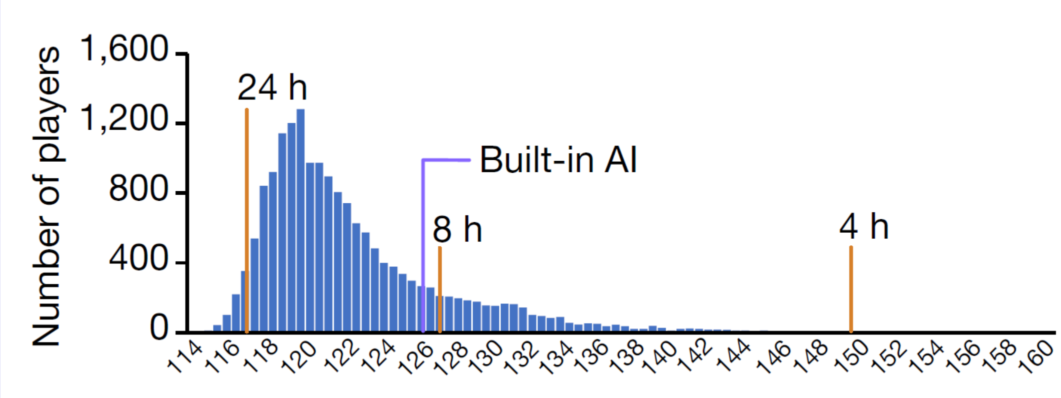
- SIE [illegible]
  [illegible]
- [illegible]
- [illegible] PS4 [illegible]



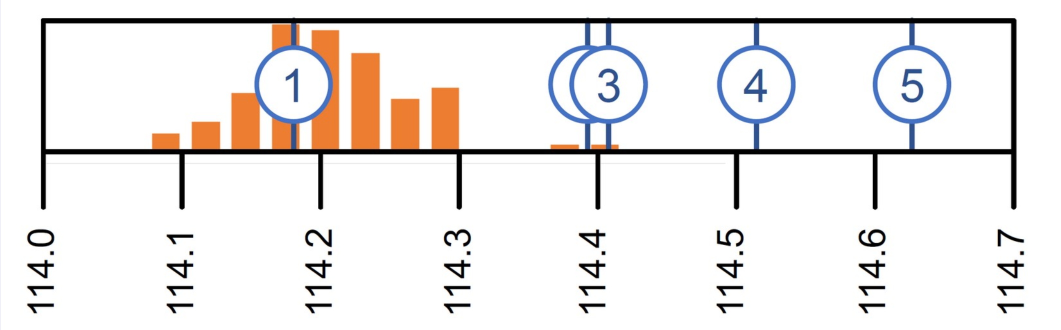
[illegible]
[illegible] Gran Turismo Sophy [illegible]
[illegible]

Time-trial [illegible]

[illegible]
GT Sophy [illegible]



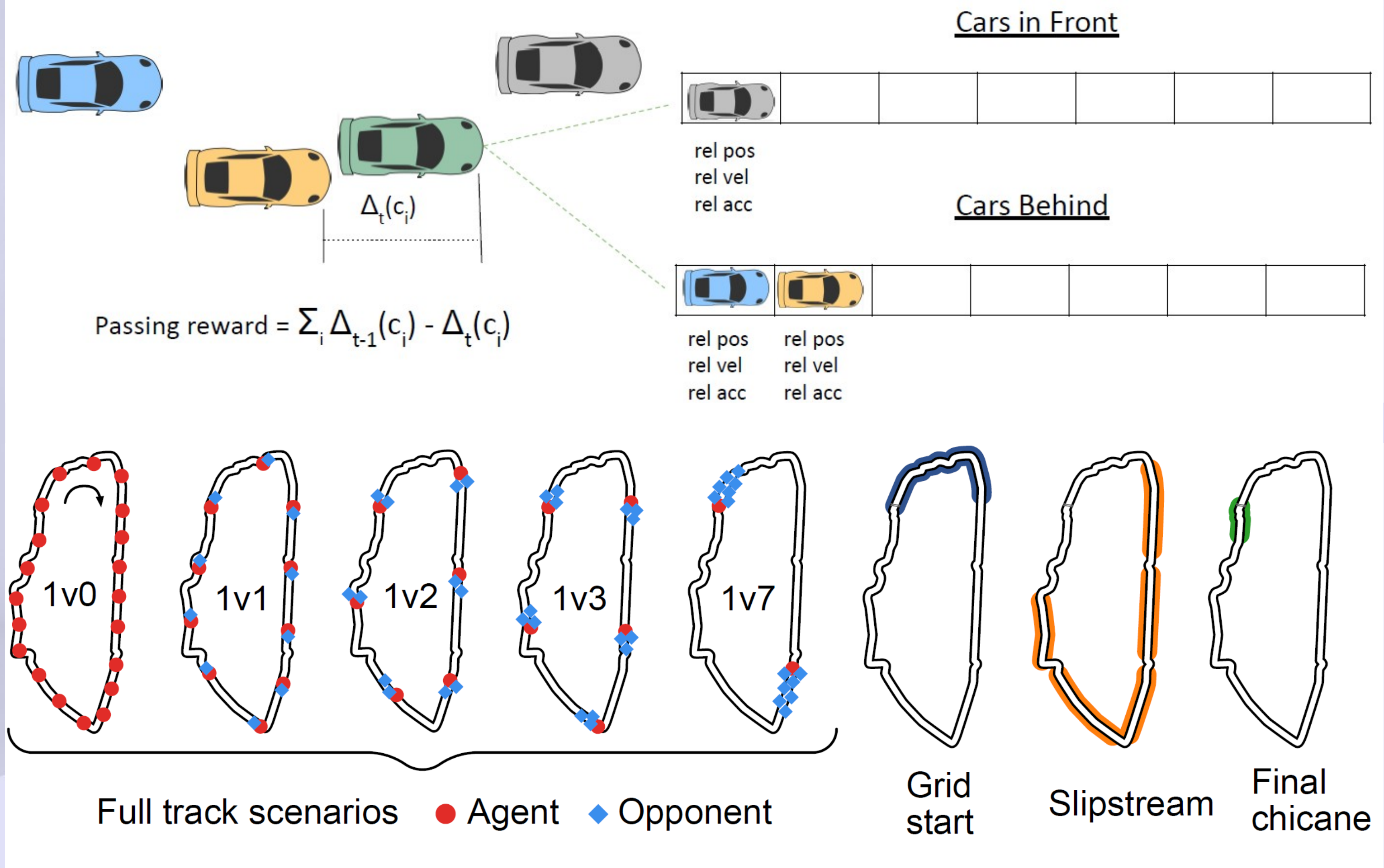
GT Sophy [illegible]



Gran Turismo Sport: TM & © 2021 Sony Interactive Entertainment Inc. Developed by Polyphony Digital Inc.
Sony AI POLYPHONY DIGITAL

[illegible] (Mixed Scenario Training)

- [illegible]
- [illegible]
  - [illegible]
- [illegible]



[illegible]

Gran Turismo Sport: TM & © 2021 Sony Interactive Entertainment Inc. Developed by Polyphony Digital Inc.

[illegible]

[illegible] GT Sophy [illegible]
[illegible]

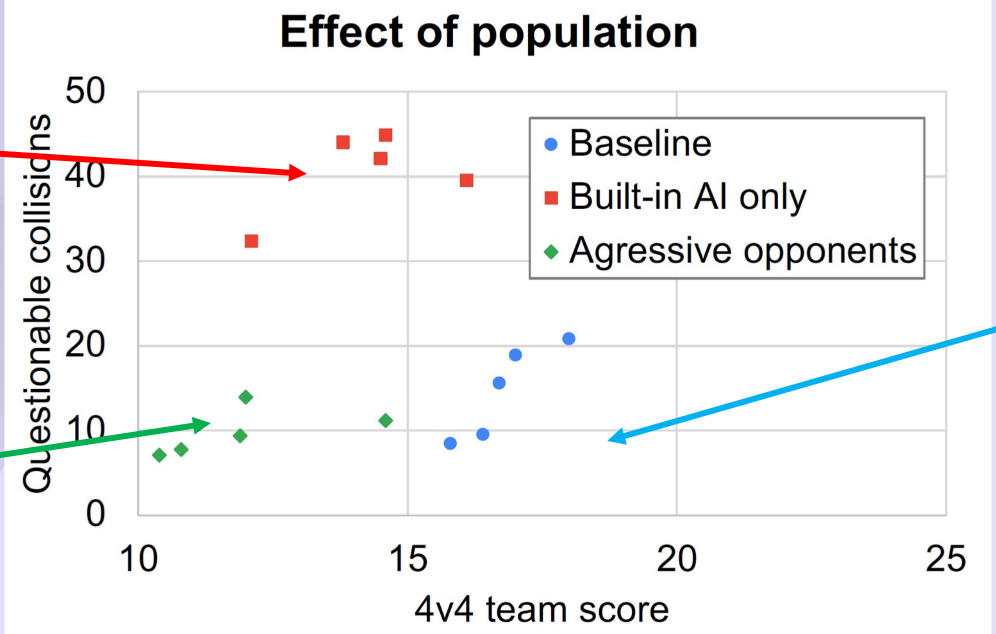
Gran Turismo Sport: TM & © 2021 Sony Interactive Entertainment Inc. Developed by Polyphony Digital Inc.

[illegible]

- [illegible]
  - [illegible]
  - [illegible]
- [illegible]

[illegible] AI [illegible]

[illegible]



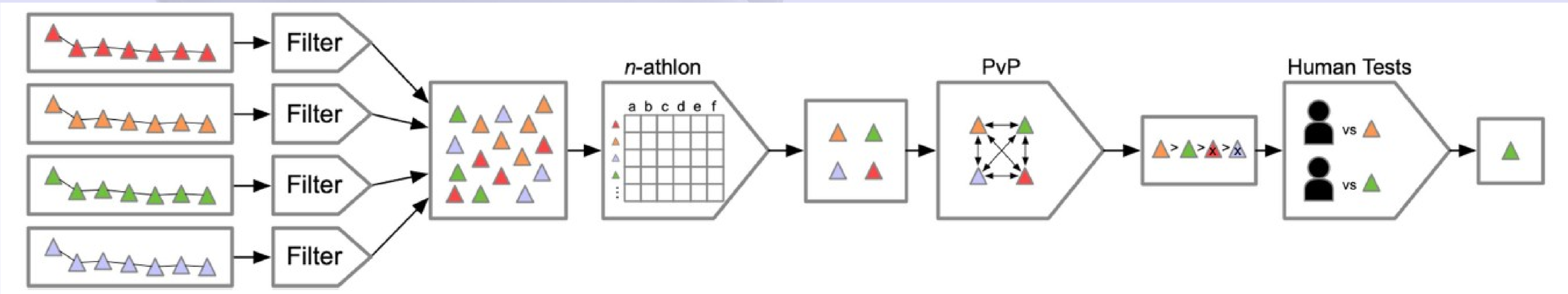
Effect of population
Baseline
Built-in AI only
Agressive opponents
Questionable collisions
4v4 team score
0
10
20
30
40
50
10
15
20
25

[illegible]

[illegible]

- [illegible]
  - [illegible]
- QA [illegible]

[illegible]



Filter
Filter
Filter
Filter
n-athlon
a b c d e f
PvP
Human Tests
vs
vs

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Game AI Breakthrough

Alpha Go

Alpha Star

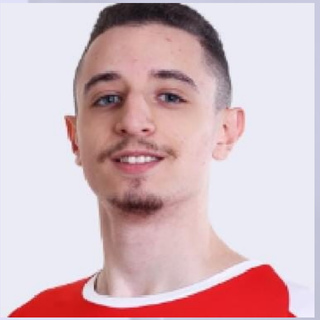
Gran Turismo Sophy

if-then

/

Sony AI POLYPHONY DIGITAL

GT Sophy [illegible]



[illegible]

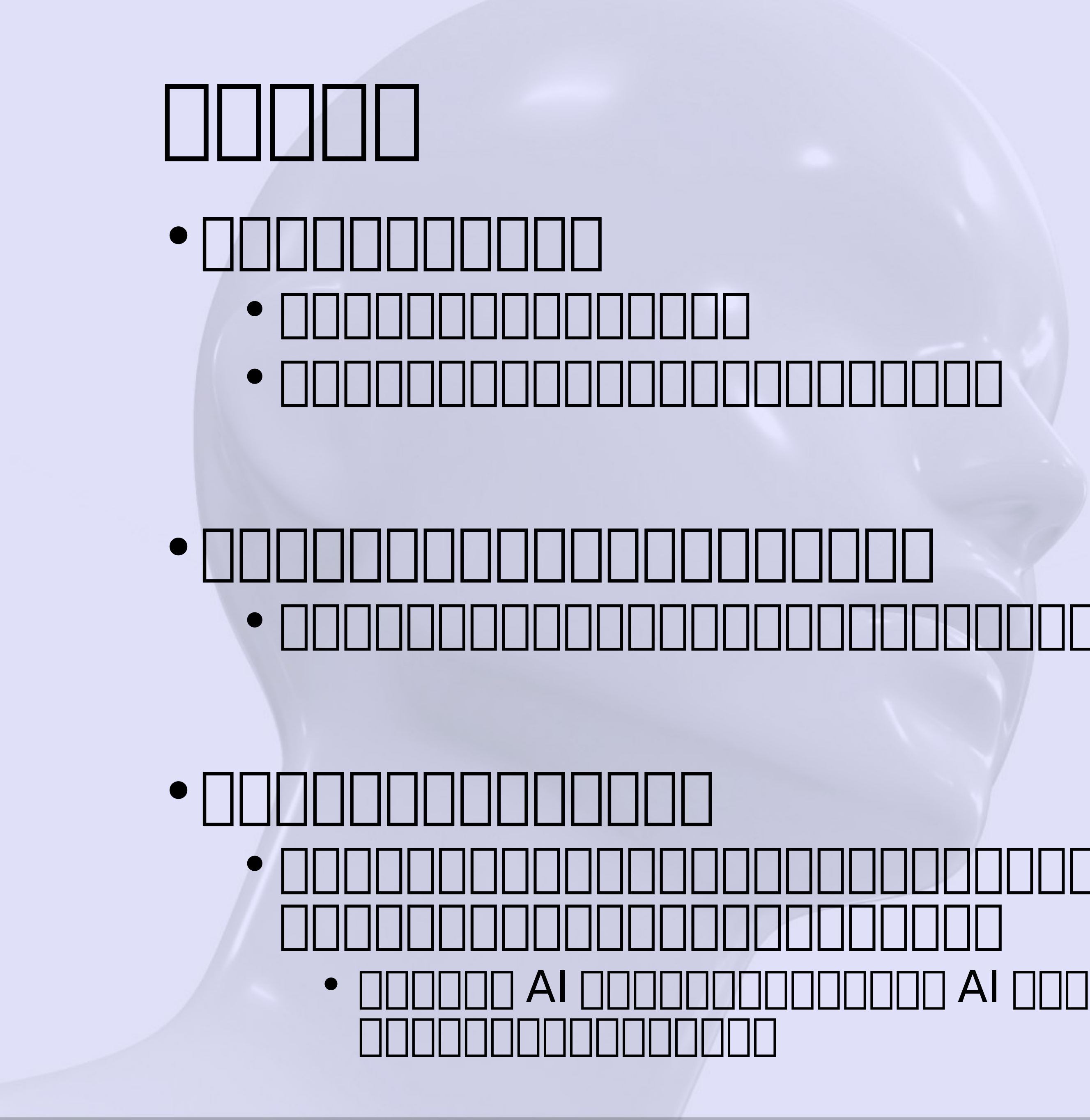
- [illegible] AI [illegible]
- [illegible]
  [illegible]

Galo [illegible]

- [illegible]
- [illegible]

[illegible]

- [illegible]
  [illegible]
- [illegible]



[illegible]

- [illegible]
  - [illegible]
  - [illegible]
- [illegible]
  - [illegible]
- [illegible]
  - [illegible]
    - [illegible] AI [illegible] AI [illegible]

GT7 [illegible]

- [illegible]
  - [illegible] CPU/ [illegible]
  - [illegible] Neural Network Libraries (NNabla)

- [illegible]
  - [illegible]

- [illegible]
  - [illegible]

[illegible]

- [illegible]AI[illegible]
  - [illegible]AI[illegible]
- AI[illegible]
  - [illegible]
- [illegible]AI[illegible]AI[illegible]
  - [illegible]QA[illegible]
  - [illegible]/[illegible]

[illegible]

- Gran Turismo Sophy (GT Sophy) [illegible]
  - [illegible] AI [illegible]
  - Gran Turismo [illegible] AI [illegible]
  - Gran Turismo [illegible] AI [illegible]

- GT Sophy [illegible]
  - [illegible]
  - [illegible]
  - [illegible]

Gran Turismo Sophy™

Sony AI

POLYPHONY DIGITAL